BASIS FOR THE AMENDMENT

Claims 1-3 and 5-29 are active in the present application. Claim 4 is canceled. Independent Claims 1, 8 and 18 have been amended. Independent Claim 1 has been amended to include the limitations of Claim 4. Independent Claim 8 has been amended to depend from Claim 18. Independent Claim 18 has been amended to require that the material having C, H and F is present as the main component of the etching gas. Support for the amendments is found in the original claims and on page 11, lines 11-20; page 12, lines 10-18; page 13, lines 9-15; page 15, lines 2-9. Claim 29 is a new claim. Support for new Claim 29 is found in the original claims and in the Experiment on page 13. No new matter is believed to have been added by this amendment.

REQUEST FOR RECONSIDERATION

In the Office Action of May 17, 2005, the Office rejected Claims 1-3 as anticipated by a patent to Li '278 (U.S. 6,670,278). Claims 4-17 were rejected as obvious in view of Li in combination with Demmin (U.S. 6,635,185). Claims 1-2, 4-5 and 8 were rejected as anticipated in view of Nishizawa (U.S. 6,617,244). Claims 18-27 were rejected as obvious in view of Patel (U.S. 5,958,793) in view of Nishizawa or Li '830 (U.S. 6,009,830) in view of Witek (U.S. 5,627,395). Claims 18-20, 20-23 and 25-28 were rejected as obvious in view of Nemani (U.S. 6,764,958) in view of Li '830 and Witek.

Independent Claim 1 has been amended to include the limitations of previous dependent Claim 4. The Office did not reject Claim 4 as anticipated by Li '278. Applicants submit the amendment to independent Claim 1 to include the limitations of dependent Claim 4 renders the rejection under 35 U.S.C. § 102 in view of Li '278 moot and respectfully request withdrawal of the rejection of the claims as anticipated by Li '278.

Amended independent Claim 1 states the following:

> ...introducing an etching gas into the chamber and **converting the etching gas into plasma** to etch selectively the SiC layer against the SiO_2 layer, wherein the etching gas includes CHF_3, as a main fluorocarbon component thereof, and a material having N.

Thus the etching gas that is introduced into the chamber is converted into plasma to selectively etch a SiC layer. The etching gas is explicitly described to include CHF_3 as a main fluorocarbon component and a material having N. As stated in the claim, the etching gas is converted into plasma.

The Li '278 patent discloses a process of plasma etching that includes an etching gas that may contain a fluorocarbon material of formula $C_xH_yF_z$, O_2, and an inert gas carrier. The inert gas carrier of the Li '278 process is He, Ne, Ar, Kr or Xe. The components of the Li '278 etching gas are described at column 4, lines 18-24;

> The hydrogen-containing fluorocarbon gas can be at least one of CH_3F, CH_2F_2, CHF_3 and $C_2H_4F_6$, oxygen containing gas may be O_2, CO, or CO_2 and **the carrier gas may be He, Ne, Ar, Kr, or Xe**.

Li '278 does not disclose that N_2 may be used as an inert gas or that the inert gas of the prior art process forms a plasma.

The Office asserts that it would be obvious to use nitrogen in the process of Li '278 because it is a "popular inert gas used in the art of plasma etching". Applicants submit that an inert gas is one that is not used to take an active chemical role in selective etching. An inert gas is one that has no reactivity. Applicants submit that the conversion of the etching gas of the present invention to plasma is directly contradictory to the Office's assertion that N_2 may be used as an inert gas. If N_2 were being used as an inert gas in the presently claimed process, it would not form a plasma and it would not be chemically engaged in the selective etching process. In fact, the gases of Li '278 that are described as "inert" are not described as undergoing the formation of a plasma or otherwise undergoing ionization in the prior art process.

Because the function of the He, Ne, Ar, Kr, or Xe gas of the Li '278 process is directly contradictory to the function of the N_2 gas of the present invention, Applicants submit that it cannot be obvious to use N_2 in the process of Li '278 because to do so would be directly contradictory to the explicit requirement that the He, Ne, Ar, Kr, or Xe gas of LiHe, Ne, Ar, Kr, or Xe gas is "inert".

Applicants therefore submit that a process that uses N_2 or a N-containing component in an etching gas as plasma to carry out etching is not obvious in view of a process that uses an inert gas instead of N_2 because an inert gas would not undergo conversion to a plasma and would not be chemically engaged in the etching of a SiC layer. Applicants respectfully

request the withdrawal of the rejection of the present claims as obvious in view of Li '278 in combination with Demmin.

Applicants draw the Office's attention to Claims 6-7, 9-11 and 15-16 which limit the conditions (e.g., flow rate and/or fluorocarbon N_2 ratio) of the etching. Applicants have provided data in the specification to demonstrate that certain ratios and flow rates of etching gas provide significantly superior etching performance.

The disclosure on page 13 of the specification describes a series of experiments using different flow rates and ratios of gases. The SiC etching rate of the experiment under different flow rate conditions is described in Figure 3 of the specification. As is readily apparent from an inspection of Figure 3, a much higher SiC etching rate is obtained for certain flow rates and/or etchant gas ratios.

Applicants submit that the SiC etching rates demonstrated for certain flow rates are unexpected in view of, for example, the disclosure in Nishizawa which shows in prior art Figure 3 that the etching rate may increase by the addition of N_2 but it does so in a manner that does not predict the SiC etching rate improvements observed for the inventions claimed in the dependent claims of the present application.

Applicants draw the Office's attention to new dependent Claim 29. New dependent Claim 29 states that the etchant gas is one that consists of CHF_3, N_2 and an inert gas. Applicants submit that the "consists of" transitional language used to describe the etching gas excludes gaseous components other than CHF_3, N_2 and an inert gas. Thus new dependent Claim 29 excludes O_2 as a component of the etchant gas. Applicants submit that the subject matter of new dependent Claim 29 is further patentable over Nishizawa because Nishizawa discloses etchant gases that include a fluorocarbon, oxygen and an inert gas and optionally N_2 (see, column 5, lines 62-64; column 6, lines 38-42).

As Applicants mentioned above, the use of an etchant gas containing a fluorocarbon, N_2 and an inert gas, have been demonstrated to provide significantly superior (e.g., unexpected) SiC etching rate performance as demonstrated by Figure 3 of the specification.

With respect to the rejection of Claims 18-27 in view of Nishizawa, Applicants wish to point out that present independent Claim 18 excludes the presence of oxygen from the etching gas. In contrast, Nishizawa does not exclude oxygen from the etching gas. Although Nishizawa may disclose an embodiment wherein O_2 is not required (see column 6, lines 57-67), this embodiment does not require the presence of a fluorocarbon but instead substitutes a material such as NF_3 or SF_6 therefore. Applicants submit that a process that uses a F-containing compound such as NF_3 or SF_6 is substantially different from a process that uses CHF_3 because the fluorocarbon material will have substantially different chemical reactivity and etching performance and there is no evidence of record that the use of NF_3 or SF_6 will provide similar performance or otherwise suggest the use of CHF_3.

Patel discloses the following with respect to the prior art etching gas:

> In an embodiment, the exposed surface of the SiC layer 18 is then exposed to a non-oxygen containing plasma of a gas containing carbon (C) and fluorine (F). ... The most successful etching of SiC films has been done in plasmas of pure CF_4, C_2F_6 or these gases mixed with small additions of CHF_3. (Column 2, lines 10-19).

In contrast, present Claim 18 explicitly states that the material having C, H and F is a "main fluorocarbon component". Applicants submit that the disclosure in Patel of etching gases containing perfluorocarbon materials such as CF_4 with small additions of CHF_3 is not pertinent to the patentability of present Claim 18 which explicitly requires that the CHF-containing gas be the main fluorocarbon component of the etching gas.

The main F-containing gas of the Patel etching gas is a perfluorocarbon (i.e., a organic compound containing only C and F groups). The Office has not demonstrated that the

etching performance of a perfluorocarbon is the same as the etching performance of a organofluorocarbon that contains hydrogen groups and therefore the rejections of at least Claim 18 in view of Patel is not supportable and should be withdrawn.

With regards to the rejection of Claims 18-20, 22-23, 25-28 as obvious in view of Nemani, Li '830 and Witek the Office stated:

> The claimed invention differs from the Nemani by specifying adding nitrogen to the etchant. However, it is known that inactive gas such as Ar, or N_2 may be added to the etchant to improve the uniformity of etching. (See page 6 of the Office Action, lines 2 and 3 from the bottom).

Applicants wish to point out that Li '830 does not disclose N_2 as a carrier or inert gas. Perhaps more importantly, an inert gas (i.e., an inactive gas) is a gas that would not take an active chemical role in etching (e.g., an inert gas would not chemically react with a substrate or any gases present during etching). As was noted earlier, the presence of an inert gas cannot render obvious or suggest a process wherein N_2 is used as an etching gas that undergoes conversion to form a plasma. In a plasma form nitrogen gas is reactive and may take an active chemical role in the etching process.

The Office's citation of Witek to demonstrate that N_2 is an inert gas does not cure the defects of the rejection. It is because the prior art states that N_2 gas is inert, that the presently claimed invention is patentable over the prior art. The same logic applies to the rejection of Claims 18-27 as obvious in view of a combination of Patel, Li '830 and Witek.

For the reasons described above including (i) the Office's unsupportable assertion that a N_2-containing gas that is converted to a plasma is the same as an inert gas, (ii) the Office's unsupportable assertion that a perfluorocarbon (e.g., C_xF_y) material provides the same reactivity as an hydrofluorocarbon (e.g., $H_aC_xF_y$), (iii) the prior art's silence with respect to a process that requires etching with an etchant gas that contains a hydrofluorocarbon and nitrogen but excludes oxygen, and (iv) Applicants' showing that significantly improved SiC

etching rate may be obtained when certain CHF_3 flow rates and gas ratios are used, Applicants submit that the presently claimed subject matter is novel and not obvious in view of the prior art relied upon by the Office and respectfully request the allowance of all now-pending claims.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
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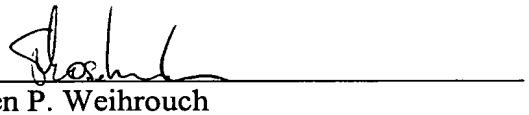

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